

CLAIMS

1. A pump apparatus which comprises:
 - a displacement pump having a reciprocatable piston positioned within a first housing having an interior wall spaced apart from said piston,
 - an interior volume of said first housing being in fluid communication with a fluid inlet to a ceramic stator and a fluid outlet from said ceramic stator,
 - said ceramic rotor and said ceramic stator being positioned in a second housing,
 - said ceramic stator having a first flat surface in sealing relationship with a second flat surface of a ceramic rotor positioned in contact with said first flat surface of said ceramic stator,
 - said ceramic rotor having a fluid passageway that controls a direction of fluid flow through said ceramic stator,
 - a position of said piston and a position of said ceramic rotor being synchronized to effect desired fluid flow through said ceramic stator.
2. The pump apparatus of Claim 1 wherein said first housing and said second housing are formed of a single element.
3. The pump apparatus of Claim 1 wherein said ceramic stator and said ceramic rotor are formed of aluminum oxide.
4. The pump apparatus of Claim 2 wherein said ceramic stator and said ceramic rotor are formed of aluminum oxide.
5. The pump apparatus of Claim 1 wherein said housing is formed of a transparent material.
6. The pump apparatus of Claim 2 wherein said housing is formed of a transparent material.

7. The pump apparatus of Claim 1 wherein said piston is formed of sapphire.
8. The pump apparatus of Claim 2 wherein said piston is formed of sapphire.
9. The pump apparatus of Claim 3 wherein said piston is formed of sapphire.
10. The pump apparatus of Claim 4 wherein said piston is formed of sapphire.
11. The pump apparatus of Claim 5 wherein said piston is formed of sapphire.
12. The pump apparatus of Claim 6 wherein said piston is formed of sapphire.
13. The pump apparatus of Claim 1 wherein said ceramic rotor is connected to a motor for effecting rotor rotation through a self-aligning coupling which effects complete flat contact between said first flat surface and said second surface when said rotor is rotated and when said rotor is at rest.
14. The pump apparatus of Claim 1 including means for periodically washing the interior volume of said housing.
15. The pump apparatus of Claim 13 including means for periodically washing the interior volume of said housing.
16. The pump apparatus of any one of Claims 1, 2, 13, 14 or 15 wherein said rotor is rotated with a rotary solenoid.